STEERING COMPASS.

Fig: I. A Section.

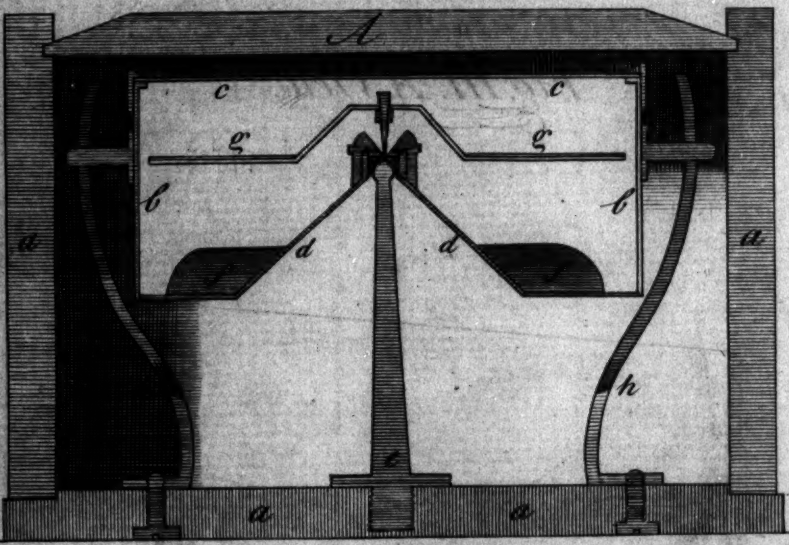
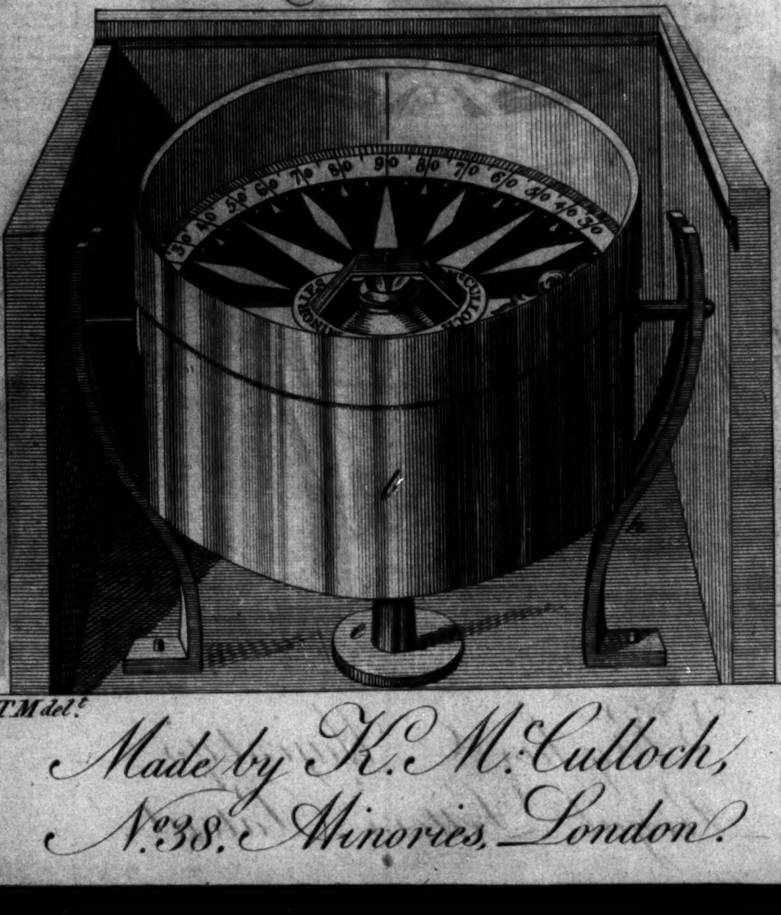


Fig: II. A View.



T M del^t.

Made by K. M^c Culloch,
N^o. 38. Minories, London.

STEERING COMPASS.

Fig: I. A Section.

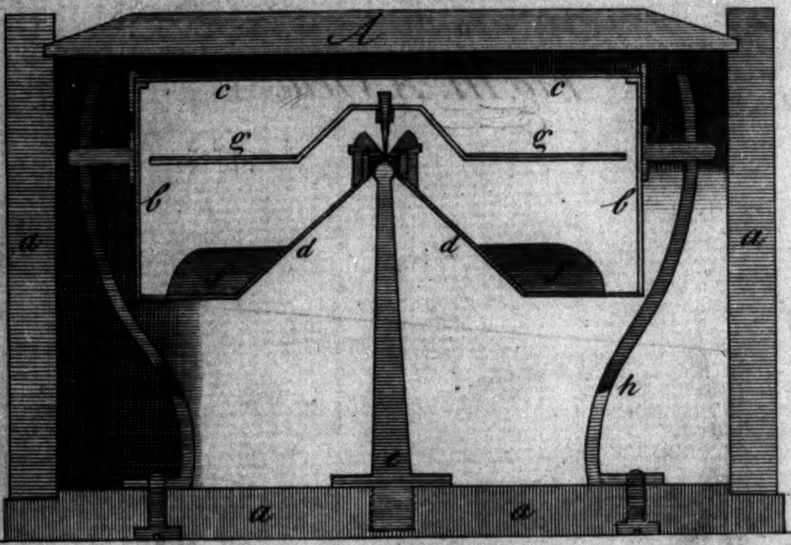
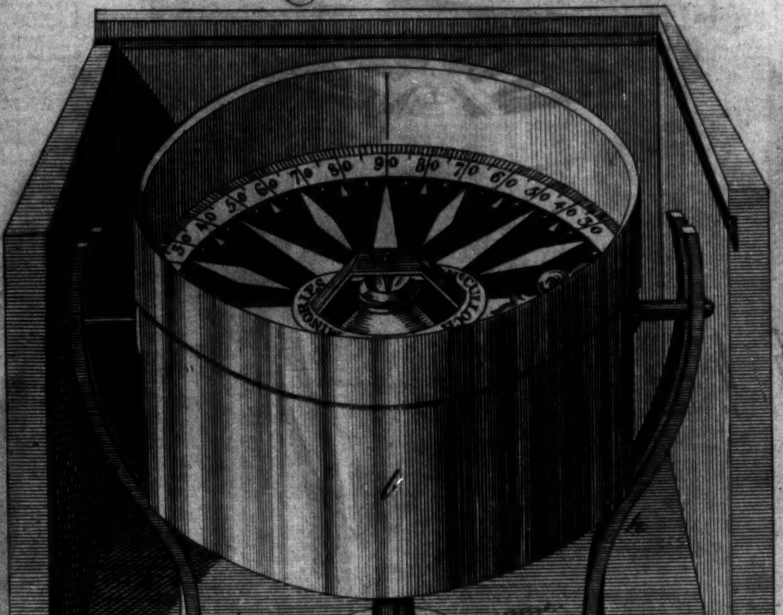


Fig: II. A View.



T.M del.t

Made by K. McCulloch,
No. 38. Minories, London.

AZIMUTH COMPASS.

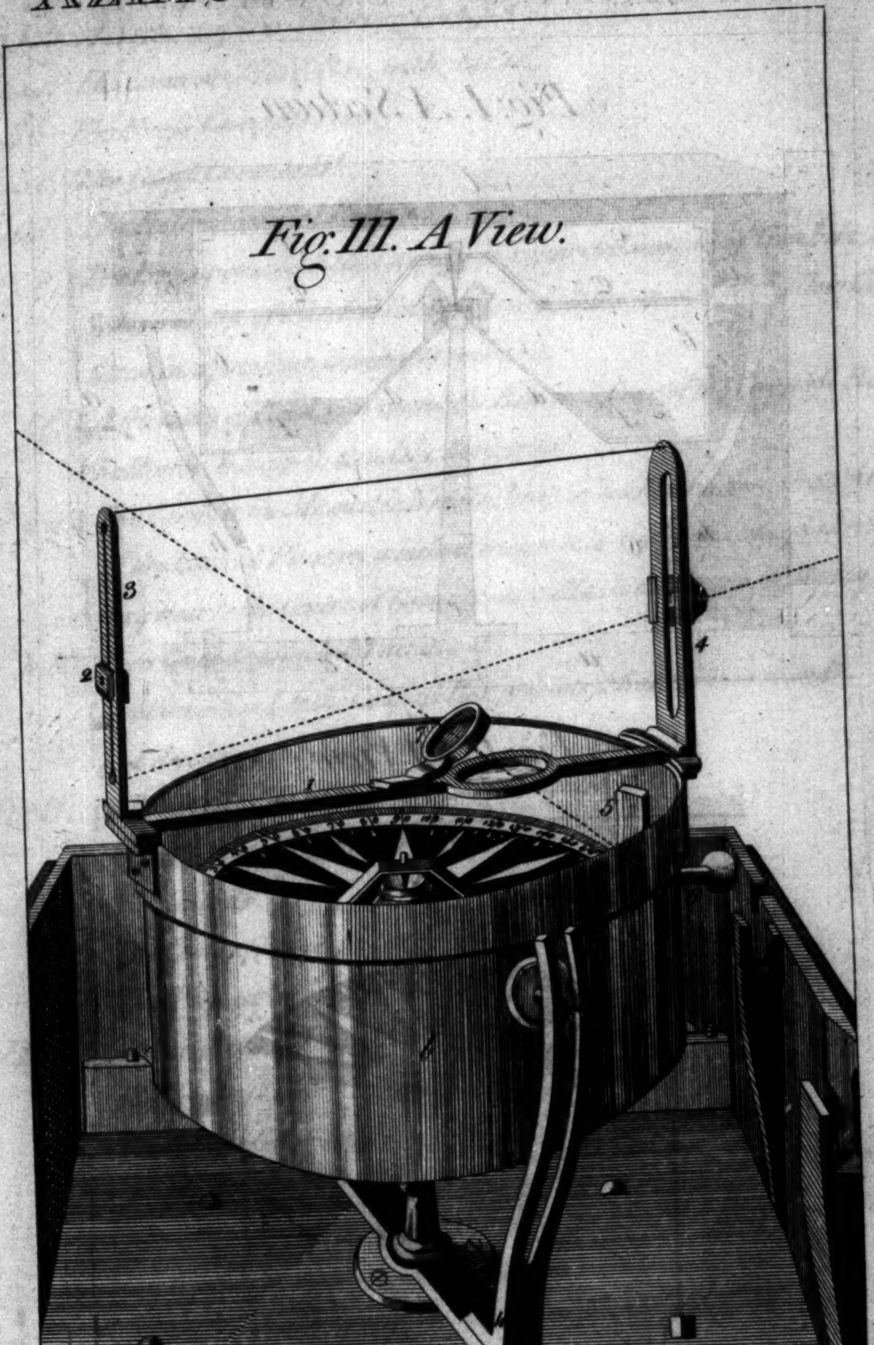


Fig. III. A View.

Carpenter Sculp!

By his Majesty's
Royal Letters Patent.

References.

Fig. 1.	A Section of the Steering Compaſs.
Aaaaa.	The common Wood Box, with its Lid.
bb	The Braſs Compaſs Box.
c.c.	The Glaſs Cover to D^o.
d.d.	The Hollow conical Bottom.
e	The Prop, upon which the Compaſs is supported instead of Gimbols; the Spherical top of which is finely polished, & the apex of the hollow Cone is fitted in a peculiar manner to receive it.
f.f.	A Quantity of Lead run round the Bottom & Cone of the Compaſs Box, to ballance & keep it steadily horizontal.
g.g.	The Card, & the Magnetic Needle, bent in such a manner that the Point of the Conical Pivot, on which it moves & is supported, may be brought very near to the Centre of Gravity, as well as to the Centre of Motion.
h.h.	Two Guards, which by means of
i. i.	Two Pins, affixed to the Compaſs Box, prevents it from turning round and deceiving the Steersman.
Fig. II.	A Perspective View of the Steering Compaſs, with the Lid off, & the front laid open.
h.h.	The Guards.
b.	The Compaſs Box.
e	The Prop &c as in Fig. 1.
Fig. III.	A View of the Azimuth Compaſs.
b.	The Compaſs Box.
h.	One of the Guards.
e.	The Prop, as in Fig. 1. & II. with this difference, that in the Azimuth Compaſs, instead of being screwed to the bottom of the Wood Box, stands in a Braſs socket; and may be turned round at Pleasure.
1	A Braſs Bar, upon which the Sight Vanes are fixed.
2	A Dark Glaſs, which moves up or down on
3	The Sight Vane.
4	A Magnifying Glaſs, which is also movable on the other Vane.
5	The Nonius, or Vernier.
6	A Slide, for moving the Vernier so as to stop the Card, in taking the Azimuth
7	A Double Convex Glaſs, by which y^e Divisions on y^e Vernier, may be read with accuracy.

All the above is more fully explained in the Pamphlet.

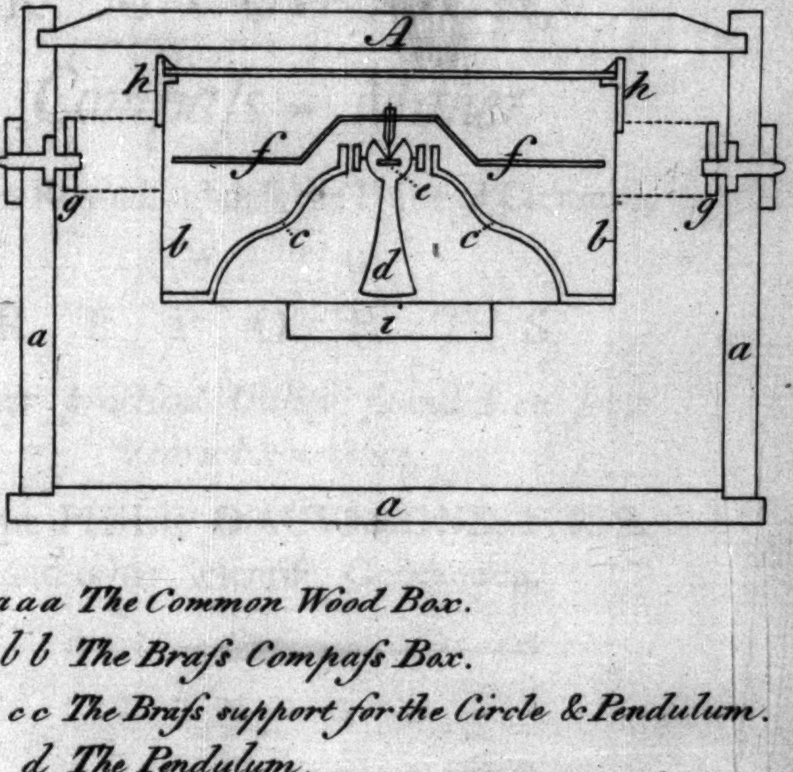
Fig IV.

This Section

Represents another Application of the

Magnetic Needle & Card.

Constructed by K. M^c. Culloch.



A a a a The Common Wood Box.

b b The Braſs Compaſs Box.

c c The Braſs support for the Circle & Pendulum.

d The Pendulum.

e The Agate.

f f The Magnetic Needle & Card.

g g The Braſs Circle.

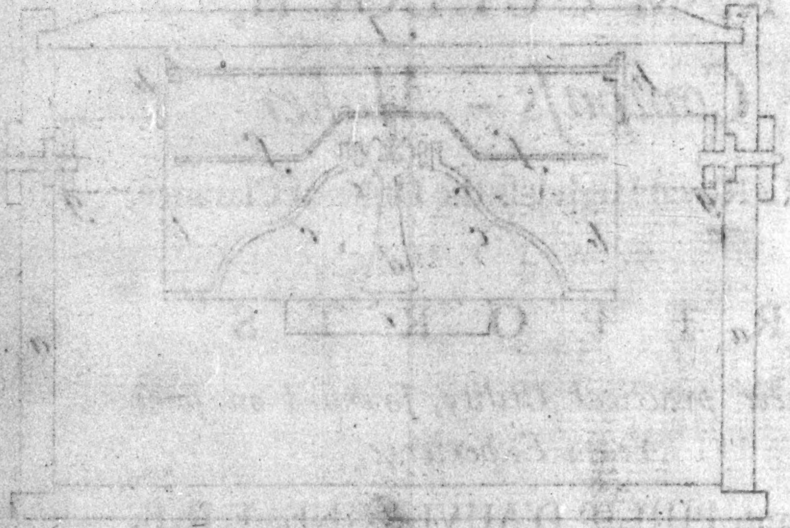
h h The glaſs cover & braſs ring.

i The Lead Weight.

NB. All the centers of Motion are in the ſame plain.

Fig. IV.

This Section
Represents another Application of the
Magnetic Needle & Card.
Contrived by K. M'Culloch



a a a The Common Wood Box
b b The Brass Compass Box.
c c The Brass supports of the Circle & Pendulum
d The Pendulum
e The Agate.
f f The Magnetic Needle & Card
g g The Brass Circle.
h h The glass cover & brass ring.
i The Lead Weight
N.B. All the centres of Motion are in the same plane.

7CCi

533.e.26
3

AN

ACCOUNT

OF THE NEW IMPROVED

SEA COMPASSES,

Made by the Patentee,

K: Mc CULLOCH,

K.

Compaſs - Maker

To His Royal Highneſs the Duke of Clarance,

WITH

REPORTS

Of their practical Utility, founded on ſome Years Experience,

By Capt. PHILIP D'AUVERGNE, F. R. S.
and other Scientific Gentlemen.

LONDON:
Printed by R. Carpenter; and ſold by K. M'Culloch,
No. 38, Minories.
1789.

Price 1s. 6d.

W: Musgrave.

AN

ACCOUNT

OF THE NEW IMPROVED

SEA COMPASSES,

BY

KENNETH McCULLOCH,

WITH

REPORTS, &c.

THE three figures in the plates prefixed to this little tract, with the references, will give the reader ſuch an idea of the new improved ſea compaſſes, that there is little occaſion for any further deſcription:—Patent inſtruments indeed are ſeldom ſo fully explained, but as no myſterious conduct is here intended, a few obſervations may not improperly be offered.

The perfection of a ſea compaſs depends principally upon the following requiſites.

1ſt. That the magnetic power of the needle be ſufficient to overcome the friction, ſo that the card may always arrange itſelf in the proper poſition.

2d. The ſtability of the needle and card, ſo that the motions of the ſhip or veſſel may not occaſion its vibrating from the proper direction.

In the firſt caſe, the patent compaſs is an improvement on the common ſea compaſſes, in ſo far as the needle is both longer and broader, it is from that and other cauſes ſtronger in its magnetiſm; and the line of its magnetic direction always correſponds with the card, an article not ſufficiently attended to in other compaſſes.—But this is not the moſt material improvement, for Dr. Knight's compaſs has been found to anſwer the purpoſe ſufficiently in calm weather, or in a ſmooth ſea; tho' in a ſtorm it ſeems the worſt of all compaſſes.—In the ſecond caſe, therefore, to prevent the motions of the veſſel from affecting the needle, which is by far the moſt difficult point to be attained.—The patent compaſs-box inſtead of ſwinging in gimbols at right angles to each other, is ſupported in its very center upon a prop; and whatever motion the other parts of the box may have, this center being in the vertex of the hollow cone, may be conſidered as relatively at reſt, and therefore gives little or no diſturbance to the needle.

Again, the pivot or centre upon which the needle moves, is ſo contrived as to ſtand always perpendicular over the centre of the compaſs-box, or apex of the hollow cone, as upon a fixed point, and is therefore ſtill leſs affected by the motions of the veſſel.

Thus the centres of motion, of gravity, and of magnetiſm are brought almoſt all to the ſame point: The advantages of which will be readily perceived, by every perſon who knows any thing of the true principles of mechaniſm.

To enter therefore more minutely into the ſeveral contrivances of improvement in this new compaſs would be ſuperfluous;—time and experiment, the true teſts of all improvements, or ſuppoſed improvements, muſt determine their real merits and utility.

From the repeated trials however, which have been made of theſe patent compaſſes in various parts of the globe for ſome years paſt, the patentee has been favored with very encouraging reports, from gentlemen of the moſt diſtinguiſhed abilities.

It is therefore reaſonable to ſuppoſe that the reader will not be diſpleaſed, or think it improper, that a few of theſe reports and opinions of gentlemen, diſtinguiſhed for their abilities and impartiality ſhould be hereto annexed.

Extracts of Letters from ſundry Gentlemen, relating to KENNETH M'CULLOCH'S improved Sea Compaſſes.

From Capt. *Philip D'Auvergne*, of the Royal Navy, F. R. S. &c.

Narciſſus, 21ſt *of September*, 1787.

YESTERDAY in my paſſage through the Downs, your letter of the 11th of Auguſt, reached me.

As I have not been at Portſmouth theſe ſix weeks, I have not got the ſteering compaſs, and artificial horizon, you mention to be addreſſed to me there.

I am preparing a report, which I ſhall addreſs to the Admiralty, and Board of Longitude, that I truſt will recommend in doing juſtice to your compaſſes.

I have followed up, in all ſituations of the late boiſterous weather, my obſervations with reſpect to their ſuperior utility to thoſe of the common conſtruction, and have great pleaſure in congratulating you and my brother ſailors on their ſucceſs.

Be aſſured, my good Sir, that I will give the account they appear to me to claim, and that I will ever have the moſt lively gratification in proving the conſideration with which I hold your laudable exertions, in the improvement of an inſtrument ſo important to the naval intereſt of a maritime country.

I am, &c.

To Mr. Kenneth Mᶜ Culloch.

Narciſſus, 13th of May, 1788.

From the ſame.

I Have the ſatisfaction to inform you, that the ſet of compaſſes, that I directed to be conſtructed for *His Royal Highneſs Prince William Henry,* were ſafely received a few days previous to my leaving the Prince at Plymouth.—— I fixed them properly, and explained the propoſed advantages that are hoped from your improvment of them to his Royal Highneſs, who approved very highly of your meritorious application to the improvement of that very eſſential inſtrument.

Their coſt will be forthwith remitted to you, and His Royal Highneſs has promiſed me, that the moſt particular attention will be paid to aſcertain their improved utility, which he is graciouſly pleaſed to patronize, having at my inſtance named you his compaſs-maker.——His Royal Highneſs has likewiſe been pleaſed to command me to direct you to adopt that ſtile, where and when you ſee proper.

I am flattered with the hope that His Royal Highneſs's gracious condeſcenſion, in favor of a perſon who devotes his ingenuity to the perfection of nautical inſtruments, will create a proper and becoming emulation.

I therefore urge you to perſevere in perfecting the ſea compaſs as much as it is yet ſuſceptible of, and deſire you to be aſſured of my beſt contributions to that effect.——I very much approve of the ſtop to the azimuth compaſs, as fixed to that conſtructed for His Royal Highneſs :—The only addition I have to recommend is, that you will add to the gravitation of the compaſs veſſel, by ſcrewing a plate of lead to the bottom of it, below and round the inverted cone on which it traverſes, which will give the ſteering compaſs (particularly) more ready ſtability; that it already has very ſuperior to thoſe of the common conſtruction, though yet ſuſceptible of more by my propoſed addition.

The compleat report will be conveyed to you when I have a little leiſure.

I have ſubmitted the compaſs to the opinion of the principal officers of the ſquadron at Plymouth, and to thoſe of the corps of royal engineers, who as men of ſcience are very competent judges.

The general approbation which theſe inſtruments meet, I truſt will encourage you to perſevere, and

I can venture to add, that the further patronage of His Royal Highneſs will be the reward of your continued induſtry.—That you will have all the ſupport of my good offices with His Royal Highneſs, and the Navy in general, you may reſt aſſured,—being with much conſideration.

S I R,

Your's, &c.

Signed P. D' Auvergne.

To K. M. C.

Capt. *D'Auvergne's* Letter with the Report.

Sir,

ENCLOSED, I ſend you the reſult of my obſervations on your compaſſes.——I ſend the original, (of which this is a copy) to the Admiralty, I likewiſe ſend a copy to the Navy Board: that it may be of uſe to you, I ſincerely wiſh.

You have my full conſent to make what uſe of it you pleaſe.——I hope you will continue and perſevere in compaſs making; your laudable endeavours to perfect that uſeful and neceſſary inſtrument, will, I hope, meet with every encouragement, in which you ſhall ever have my beſt ſupport and contribution.———I ſhall be glad to hear from you at all times, when any thing new ſtrikes you, that you may wiſh to ſatisfy yourſelf, by any experiment that can be made in any ſhip under my command, for the improvement of navigation, or marine ſcience, at which you will be moſt welcome to attend. I wiſh you ſucceſs, and am with much conſideration.

Your's, &c.

Signed Phil. D' Auvergne,
Captain in the Royal Navy.

To K. M. C.

On board His Majeſty's Ship Narciſſus, the 29th of December, 1788.

A REPORRT on the practical utility of Kenneth M^c Culloch's improved Sea Compaſſes, by Captain Philip D'Auvergne, of the Royal Navy.

SOON after I was appointed to the command of His Majeſty's Frigate, Narciſſus, in April, 1787, a friend of mine mentioned an improved ſea compaſs, invented and conſtructed by a

Mr. Kenneth M'Culloch, an ingenious Mathematical Inſtrument-Maker, in the City of London.

As one of the intentions of my taking the command of the Narciſſus was, (in proſecuting the ſervice upon which the ſhip might be employed,) to improve myſelf and ſeveral young officers, who embarked with me, in profeſſional knowledge, I made the reſolution to prove, as far as in my power, all ſuch experiments as ſhould be communicated to me, whoſe reſults, if favorable, would tend to throw lights, or add any improvements to the marine ſcience.

Having ever conſidered the ſteering ſea compaſs, among the firſt in conſequence, I deſired from Mr. M'Culloch a complete ſet of his improved compaſſes: He furniſhed me conſequently with an azimuth compaſs, a ſteering compaſs, and two leſſer ones; one of which was particularly conſtructed for a boat.

The principal difference of theſe ſeveral compaſſes from thoſe on the common conſtruction are;——that the box in which the magnetic needle traverſes is not ſuſpended in hoops, or circles, and gimbols as the common compaſſes are, but the centre of its bottom being in the ſhape of a cone, it is placed upon a vertical prop, ſcrewed on a plate in the bottom of the ſquare wooden box, in which the compaſs traverſes; the head or point of which prop is of hardened bell metal of a rounded ſhape, and poliſhed to facilitate the traverſing freely of the box: the apex of whoſe cone is fitted with a perforated braſs cap, on which lays a ſmall parallel plate of agate or bell metal, confined to this ſituation by another concaved and equally perforated braſs cap that ſcrews on it above, this plate reſts on the prop deſcribed above, and ſupports the box in its traverſes.

Mr. M'Culloch to bring the centre ofgravity of the card as near to the centre of motion as poſſible, hath bent the magnetic bar or needle in parallels, nearly to the cone of the box, leaving a proportion of it as a flat fruſtum in the mid length of which he hath ſcrewed a piece of ſteel with the apex inverted, on which the magnetic bar reſts through the perforation of the upper braſs cap on the agate or bell metal fulcrum; which is conſequently reciprocally oppoſed to both centres of motion.———The card which is cut out in its centre equal to the diameter of the bent part of the bar, is fixed on the flat part of it, round the conical fulcrum.

The poles of the card are alſo preciſely in the centre of attraction of the needle, which has not been found to alter but a very trifle, of no conſequence in practice during my experience on the compaſs.

As Mr. M'Culloch has ſecured his invention by royal letters patent, and is very ready at all times to communicate that and his other ingenious inventions to amateurs, and particularly to ſea officers. I will go into no further details, but add the judgement which eighteen Months experience of his inſtruments in the channel of England has given me opportunity of forming.

Of the different compaſſes which I have mentioned that he furniſhed me with, I ſent the boat compaſs on board one of His Majeſty's packets, on the Falmouth ſtation, and the other ſmall one I committed to the care and obſervation of a Lieutenant of the Navy, of known judgment and experience, who commands one of His Majeſty's revenue veſſels in the channel, of both I have received favorable accounts, though I am not in poſſeſſion of the details of the obſervations.

A captain of the Navy (Capt. Harvy, of the Roſe,) commanding one of the frigates lately returned from Newfoundland, who has given one of them a fair trial, ſpoke favorably to me lately of its advantages over the common compaſſes, with which His Majeſty's ſhips are ſupplied, though he added, he had not taken time to conſider whether much of that ſuperiority was owing to the principle, or to the nicety in the conſtruction of the inſtrument.

The ſteering compaſs has been kept in one of the *binnacles on the quarter deck of the Narciſſus, and compared with the others; its practical ſuperiority has been manifeſted to the ſatisfaction of all the officers of the ſhip, on all general occaſions, and on many particular ones, one of which I ſhall mention here.

Sailing through the Race of Alderney in a ſtorm of N. E. Wind, in December, 1787, againſt a flood tide, the ſhip ſailing at the rate of eleven miles on the ſurface, and ſcarcely making any head way by the land, the ſea as will readily be concluded by naval judgments, was of an awful height, and ſo extremely irregular, that the motion is undeſcribable.—None of the compaſſes of Mr. Adams's on Dr. Knight's conſtruction would ſtand (in the ſea phraze,) but vacilated more then four points on each ſide of the pole; at this time Mr. M'Culloch's ſteering compaſs quickly and readily recovered the vacilations, communicated to it by the motion of the ſhip and the

---

* 'Tis proper here to notice, that contrary to a general but bad cuſtom, the compaſſes ſhould be kept ſingle in the binnacle.—It is to be wiſhed that this circumſtance were more generally attended to, as I have ſatisfied myſelf by experiment, that two compaſſes, even at three feet aſunder, attract or repulſe each other in porportion to their diſtance, and conſequently err in their polarity.

ſhocks of the ſea, pointing with very little variations to its pole, in a manner to command the admiration of all that were within reach to obſerve it, and to win the confidence of the moſt timorous.

I acknowledge myſelf, that I would have put the higheſt truſt in it, had a fog or thick weather come on in the critical ſituation we were in: while the compaſſes ſupplied from His Majeſty's ſtores were only fit to convey alarm and inſpire anxiety and doubts.

So much was I ſatisfied then and ſince, in various inſtances, that I never will be, while I can afford the price of it, without one.

The only objection ever made to it has been, when it was almoſt calm weather, and perfectly ſmooth water, that it rather wanted ſuſceptibility to return to its pole when the ſhip was yawed about: an objection that I apprehend Mr. M'Culloch may remove, by charging the bar with a little more magnetiſm; and I muſt obſerve that at all times its direction to the pole will be more ſuſceptible, if the agate fulcrum be preferred to the bell metal, into which laſt the inverted pin on which the bar ſwings very ſoon wares a ſmall hole, which impedes the activity of its movements towards the pole, which can never happen when the agate is preferred.

The difference of the price or expence is ſo trifling that it can never become a conſideration.

Many perſons may object to the improvements, concluding that Mr. M'Culloch's compaſſes are complex machines, ſubject to be eaſily put out of order, and difficult to be repaired. I find no heſitation in declaring them otherwiſe: the compaſſes on this principle conſtructed with the care with which thoſe I have, appear to have been, are fit to go the longeſt voyages to which, either our commerce or ſpirit of diſcovery can extend.

The card is fixed in ſo ſimple a manner to the needle, that it may eaſily and without injury, be changed to its proper correſpondence with the center of attraction, when it is found by experiment to have altered.——The one which has been eighteen Months in conſtant uſe, in the boiſterous ſea of the Britiſh channel, is as perfect as it was the Day it was embarked.

I ſhall now ſpeak of the Azimuth compaſs, the box and magnetic bar of which are on the ſame principle and conſtruction as the ſteering one deſcribed.—It is further ſuperior to the common azimuth compaſs, in the ſtop, the vernier diviſions are on a plate ground concave to the ſegment of a circle of the ſame diameter as the azimuth circle of the card, which prevents any the leaſt vacilation when it comes in contact with it.

When the azimuth is taken, the ſtopping of it is effected without a jerk, by preſſing in the ſmall braſs ball, which is fixed to the exterior end of a ſquare bar, whoſe other end is fixed to the nonius plate, and which bar is fitted exactly to a ſquare ſocket, firm to the ſide of the braſs box: This with other improved minutiæ give this inſtrument great advantages for obſervation over the common azimuth compaſs.

I have made many obſervations with both at different parts of the channel, both on ſhore on ſome of the projecting head lands, and on board ſhip; all which will be ſubmitted at a proper time to the Admiralty.

Different and ſucceſſive obſervations by Mr. M'Culloch's compaſs, made in the ſame ſituation, in which the ſine and the complement of the azimuth bearing were alternately obſerved, never differed in the proportion they did by the other, which appears to be conſtructed with the ſame care as they uſually are.

The compaſſes with which they have been compared, as well the ſteering as azimuth, were on Dr. Knight's conſtruction by Adams, and bore the uſual certificate of Mr. Maghallans.

My own ſatisfaction of the ſuperiority in practice of Mr. M'Culloch's magnetical inſtruments, induced me to mention them in favorable terms to His Royal Highneſs Prince William Henry; who was graciouſly pleaſed, (with that liberal ardour that His Royal Highneſs manifeſts on all occaſions for the naval ſervice and its improvements,) to command me to direct Mr. M'Culloch to ſend him a ſet of his compaſſes, which are now on board His Majeſty's ſhip, the Andromeda, under His Royal Highneſs's patronage; who was likewiſe graciouſly pleaſed at my inſtance, as an encouragement to the emulation of Mr. M'Culloch, to permit him to announce himſelf to the public as His Royal Highneſs's Compaſs-Maker.

Mr. M'Culloch hath this year furniſhed me with another compaſs, which he has conſtructed for a boat.

It has no ſecond box, but the ſocket, on which the point in the bend of the magnetic bar of the card reſts, is fixed on the apex of a pendulum, which ſwings in gimbols. This machine rather more complicated than will proſſible do for general uſe, I have found by experience, anſwers all the purpoſes of ſuſceptibility in the ſmootheſt water, its affection to its pole being very prompt and ready.

I ſhall conclude with a wiſh (from an intimate conviction of the utility of Mr. M'Culloch's induſtrious application,) to recommend that ingenious Artiſt in the ſtrongeſt manner, to the countenance and encouragement of all my brother officers, and others concerned with the improvements or ſafety of navigation.

Signed Phil. D'Auvergne,
Captain in the Navy,
commanding the Narciſſus, Frigate,

Dated on board His Majeſty's
Frigate, Narciſſus.
29th December, 1788.

Eglinton, 23d February, 1787.

S I R,

SUFFER me to communicate my fulleſt approbation of your improved compaſs, having in the courſe of my voyage to Virginia, tryed its ſuperior excellence in every poſſible ſituation, not only in the ſhip, but alſo in the boats; in all which ſituations have found it ſo unerringly true, that I

My own ſatisfaction of the ſuperiority in practice of Mr. M'Culloch's magnetical inſtruments, induced me to mention them in favorable terms to His Royal Highneſs Prince William Henry; who was graciouſly pleaſed, (with that liberal ardour that His Royal Highneſs manifeſts on all occaſions for the naval ſervice and its improvements,) to command me to direct Mr. M'Culloch to ſend him a ſet of his compaſſes, which are now on board His Majeſty's ſhip, the Andromeda, under His Royal Highneſs's patronage; who was likewiſe graciouſly pleaſed at my inſtance, as an encouragement to the emulation of Mr. M'Culloch, to permit him to announce himſelf to the public as His Royal Highneſs's Compaſs-Maker.

Mr. M'Culloch hath this year furniſhed me with another compaſs, which he has conſtructed for a boat.

It has no ſecond box, but the ſocket, on which the point in the bend of the magnetic bar of the card reſts, is fixed on the apex of a pendulum, which ſwings in gimbols. This machine rather more complicated than will proſſible do for general uſe, I have found by experience, anſwers all the purpoſes of ſuſceptibility in the ſmootheſt water, its affection to its pole being very prompt and ready.

I ſhall conclude with a wiſh (from an intimate conviction of the utility of Mr. M'Culloch's induſtrious application,) to recommend that ingenious Artiſt in the ſtrongeſt manner, to the countenance and encouragement of all my brother officers, and others concerned with the improvements or ſafety of navigation.

Signed Phil. D'Auvergne,
Captain in the Navy,
commanding the Narciſſus, Frigate,

Dated on board His Majeſty's
Frigate, Narciſſus.
29th December, 1788.

Eglinton, 23*d February*, 1787.

S I R,]

SUFFER me to communicate my fulleſt approbation of your improved compaſs, having in the courſe of my voyage to Virginia, tryed its ſuperior excellence in every poſſible ſituation, not only in the ſhip, but alſo in the boats; in all which ſituations have found it ſo unerringly true, that I wiſh for the honor of my country, and the ſafety of navigation, as well as for your encouragement, that your compaſſes may be generally brought into uſe.

I am therefore as a ſeaman ready to anſwer perſonally any enquiries made on the ſubject.

I am,

S I R,

Your's, &c.

Signed Patrick Wodrow,
Maſter of the Eglinton,
in the Virginia Trade.

To Mr. Kenneth M'Culloch.

St. Peterſburgh, 21ſt June, 1787.

S I R,

ON my arrival here, I delivered your letter and compaſs to His Excellency Admiral Grig, who approved very much of the make of the compaſs, but at the ſame time acquainted me that he would prove the compaſs himſelf, by trying it in a twelve-oared barge, whether it would bear the ſhock of the oars.

In about ten days time he ſent for me, and acquainted me, that he himſelf with the other admirals and captains in the Ruſſian fleet, approved very much of the compaſs, and ordered me to acquaint you, that the four frigates, which are now fitting for a voyage to Kamſcatſka, on diſcovery, ſhould be ſupplied with them, when they call at Portſmouth to re-fit.

He likewiſe told me, that he would give orders for the ſhips at Cronſtade to have them alſo.

On my paſſage to St. Peterſburgh I had them in my binnacle, and found them to anſwer very well, eſpecially when carrying ſail againſt a head ſea, they pointed fair and ſteady, when the compaſs on the other ſide of the binnacle, traverſed and run about two or three points on each ſide.

I am, &c.

Signed George Watſon.
Maſter of the Alexander,
of London, in the St,
Peterſburgh Trade.

To Mr. K. M. C.

Harriot, 14*th* *July*, 1788.

SIR,

I Have had ſince my laſt letter from Jamaica, the moſt unequivocal teſtimony of the ſuperior excellence of your improved needles.

In the Gulph of Florida we had two ſevere gales of wind, the ſea run very high and croſs, which occaſioned the ſhip's having a complicated quick motion rarely experienced, under different circumſtances. During thoſe and other heavy gales on the paſſage, I have the ſatisfaction of informing you, that your compaſſes anſwered better then any I ever ſteered by, even the ſmall ſteering one, could be uſed with great truth of affection to the poles, when the common ones vibrated inceſſantly, deſcribing a ſemicircle, and very often a whole one. You are at liberty to refer any queſtions that may be aſked concerning their principles or utility to me, happy on all occaſions to do your ingenuity that juſtice, to declare my experience of their more than ſuperior uſe.

I moſt ſincerely wiſh that they, for the benefit of navigation, were more univerſally uſed.

I am, &c.

Signed Neil Campbell, Maſter
of the Harriot, of London,
in the Jamaica Trade, and an
Officer in his Majeſty's Navy.

To Mr. K. M. C,

Phœnix, 17th September, 1788.

SIR,

THE great utility I experienced in your new invented patent ſteering compaſs, on a voyage lately to Conſtantinople in the Phœnix, under my command, that I think I ſhould do great injuſtice to your merit, as well as navigators in general, if I was not to declare that I think it a very great acquiſition to navigation; and that no veſſels, coaſters, as well as foreign, ſhould be without ſo uſeful a machine.

I am, &c.

Signed Kingſman St. Barbe,
Maſter of the Phœnix, of
London, in the Turkey Trade.

To Mr. K. M. C.

In a poſtſcript he adds, that being in company with about twenty ſail of ſhips, in a hard gale of wind and bubbling ſea, in the Mediterranean, all his compaſſes run round, and were unſettled, but Mr. M'Culloch's ſteering compaſs, which to his great ſurprize, kept ſteady, and pointed fair, which enabled him to purſue his courſe, when the other ſhips were obliged to lay too. The other Maſters aſked him afterwards, how he ventured to proceed, being on a dangerous coaſt; he replied, by having a good compaſs on a new conſtruction, which he could depend upon, and would never truſt to any other.

Letter to Mr. John Hamilton Moore, from Mr. William Rhind, Maſter of His Majeſty's Ship Andromeda.

Halifax, 2d of September, 1788.

SIR,

I Received a letter from you before we ſailed to join the ſquadron under Admiral Gower, deſiring my opinion of the compaſſes ſent on board by your friend Mr. Mc Culloch.——I have to inform you that they anſwer exceedingly well, His Royal Highneſs is much pleaſed with them.——During our cruize with the fleet of evelution, and our paſſage acroſs the Atlantic, I paid particular attention to them, and pointed out to Prince William at different times, that is, in hard gales of wind, when the ſhip had much motion, and going large with a freſh breeze, at the rate of ten or twelve knots the hour.——It is in the above ſituations, particularly the latter, where they excel Ramſden's.——In ſailing quick through the water, I have obſerved the compaſſes made by Ramſden, vibrate four points each way,—whereas thoſe improved by your friend, hardly moves half a point (each way) when the motion of the ſhip is very quick.

I am, &c.

Signed, William Rhind.

To Mr. John Hamilton Moore,
London.

From the ſame.

Andromeda, Spithead, 27th May, 1789.

SIR,

YOURS of the 22d current I received, wherein you requeſt my further obſervations upon the compaſſes of your invention.——I am ſtill of the ſame opinion reſpecting your azimuth compaſſes, the many obſervations I took during the time the Andromeda was in the Weſt-Indies, perfectly ſatisfied me of their ſuperiority over the common azimuth compaſſes, ſupplied His Majeſty's Ships from the naval yards.

I am, &c.

Signed, William Rhind.

To Mr. K. M'C.

REPORT from Lieutenant Gabriel Bray, Commander of the Hind, Revenue Cutter, to Captain Philip D'Auvergne.

Hind, Revenue Cutter, Plymouth, 22d *April*, 1789,

Dear Sir,

I Am to return you many thanks for the preſent of the compaſs you made me laſt year, (conſtructed by Kenneth M'Culloch) and in juſtice to the merit due to him for ſo good and uſeful an invention, I here incloſe you my remarks and opinion on it.

I have ever found it to traverſe quick in ſmooth water and little motion, when the compaſſes (allowed by the honorable board of cuſtoms, made by Meſſrs. Edwards and Killbington, of Wapping.) were tardy in moving.

On the contrary, when going through the Race of Portland, and St. Albans, which I ſeveral times did laſt year, it ever ſtood, when the other compaſſes ran round, and in gales of wind, and ſhort heavy ſeas, it was the only compaſs I could truſt to.

I therefore think it my opinion, that the ſaid compaſſes ſhould be humbly recommended to the uſe of the navy of Great Britain, and the ſea ſervice in general.

I am, &c.

Signed, Gabriel Bray,
Lieutenant and Commander of the Hind,
Revenue Cutter.

To Captain Philip D'Auvergne,
F. R. S. commanding His
Majeſty's Ship, Narciſſus.

N. B. The patentee has in his poſſeſſion ſeveral other letters, from gentlemen of known abilities in nautical affairs, who have expreſſed their approbation in ſuch terms, as to be publiſhed by him might appear too oſtentatious;—he ſhall therefore, only add the following.

[*Poole*, 26*th June*, 1786.

SIR,

YOUR compaſs is one of the beſt I ever ſaw, knowing it by experience, being out in a very high ſea, and it traverſed remarkably well, but no more affected than had it been in a calm.

I am, &c.

Signed, C. Sturt.

To Mr. K. M'C.

P. S. The only objection which the patentee has hitherto heard of his compaſſes, (for he wiſhes to mention objections as well as recommendations, when ever they occur,) is this, that they are complex, and eaſily put out of order. To the man who had only been accuſtomed to the quarter-ſtaff, Davis's quadrant ſeemed complex, and to him who had always uſed Davis's—Hadley's quadrant at firſt appeared ſtill more complicated, But when a real improvement appears, ſuch prejudices are in time got over.

What would we ſay now of the navigator, who preferred a Davis's quadrant to the ſextant of Ramſden, tho' it is more complex.

The fact is, that the preſent patentee has been at great pains to introduce every poſſible improvement, that the ſea compaſs, the moſt important inſtrument now in exiſtence, is capable of.

The patent azimuth compaſs, therefore at firſt ſight appears complicated; yet the very ingenious captain D'Auvergne ordered a compaſs for his own uſe to be made ſtill more complex, and the improvement, tho' a little expenſive, was at once conſpicuous.

If any gentleman, therefore, wiſhes to have the azimuth compaſs only, with the uſual ſights, the dark glaſs and a common thread, they are leſs expenſive to be ſure, and, if you pleaſe, leſs complex; but the moſt material improvements ſtill remain, and to appearance are not ſo complicated. The magnetic needle being bent in ſuch a manner, as was neceſſary to humour the motion of the veſſel, appears rather more complex than a ſtraight bar, but it is ſtronger.

The apparatus, which is fitted to the apex of the hollow cone, conſiſts of four different pieces, which to the workman are indeed complex and troubleſome, but when they are once finiſhed, they to all appearance become a part of the compaſs box; and the only articles that can be put out of order, are the very thin plate of hard metal, and the pivot on which the needle moves; The patentee has therefore provided a number of ſuch plates and pivots; and if the point of the pivot ſhould be hurt, any perſon of common capacity may put in a new plate, agate, or pivot, as occaſion may require.

Theſe advantages are therefore gained by its being made complex, or of ſeveral pieces inſtead of one piece,

Kenneth M'Culloch.

FINIS.

PRICES.

Of the PATENT COMPASSES made by

K. M'CULLOCH,

No. 38, *Minories, London.*

	£.	s.	d.				
Azimuth Compaſſes from	9	9	0	to	12	12	0
Large ſize Steering ditto	2	12	6				
Middle ditto	2	2	0				
Small ditto	1	11	6				